eComment. Creatinine in the diagnosis of acute kidney injury following cardiac surgery with cardiopulmonary bypass

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We read the article by Takaki *et al.* [1] with great interest, owing to the fact that the onset of kidney failure in the postoperative period following cardiac surgery is, perhaps, the most common complication and one that is linked to high morbidity and mortality and increased hospital stays, both in the ICU and generally; it is an independent predictor of mortality following cardiac surgery [2,3].

Several authors have highlighted the role of creatinine as a predictive factor in the development of acute kidney injury (AKI). The majority of studies are based on the analysis of raised creatinine levels, and do not take into account reductions to the figures due to haemodilution, a consequence of the priming of extracorporeal circulation (ECC). In this sense, the analysis of these authors is very interesting, as it looks at the correlation between changes in creatinine levels and haematocrit [1]. The issue of optimum haematocrit levels that should be maintained during ECC in order to reduce the incidence of AKI is widely debated [4].

We conducted an analysis of a sample of 1054 patients who underwent cardiac surgery between January 2013 and January 2015, of which the following were excluded: transplant patients, those with kidney diseases, those under 18 years of age, and those who underwent surgery without cardiopulmonary bypass (CPB). A final sample of 810 was studied, of which 137 (16.9%) presented AKI according to the RIFLE criteria. We analyzed some of the variables indicated by the authors within the limits of the study. We observed that CPB time is an independent predictive factor in the development of AKI (OR, 1.01; IC, 1.01-1.02). On comparing the patients without AKI with those who did develop it, we observed differences in the fluid balance (24 h) 1318 ± 1270.3 ml vs 2739 ± 2166.0 ml, $P < 0.001$; the total fluids administered (24 h) 4102 ± 1388 ml vs 5857 ± 8385 ml, $P = 0.02$ and haematocrit 29.1 ± 4.4% vs 28.2 ± 4.2%, $P = 0.02$. There were no differences observed in diuresis, which, as the authors note, may be related to the use of diuretics; diuresis (24 h) 1843 ± 1586 ml vs 1869 ± 1049 ml, $P = 0.85$.

Taking haemodilution into account is very important in this patient group, as the diagnosis of AKI may be delayed until tubular damage has already set in. Changes to plasma creatinine levels appear later, typically 48 hours after the aggression of the surgery [5].

In terms of scales for the diagnosis of AKI in the postoperative period following cardiac surgery, the most commonly used are RIFLE and AKIN. It has been shown that applying AKIN without first correcting plasma creatinine levels to take into account fluid balance may lead to overdiagnosis of AKI (reducing the positive predictive value). Modification of RIFLE so that all patients who require kidney replacement therapy are included in class F (failure) may improve the predictive value of the scale. Taking into account the limitations of both systems, it is preferable to apply the RIFLE criteria as we did in this analysis. In this context, the use of other parameters, such as the creatinine reduction ratio, with the considerations contributed by the authors, may be useful for the early diagnosis and treatment of kidney injury in the postoperative period following cardiac surgery.

Conflict of interest: none declared.

References

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